What is GTAP?

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Motivation for GTAP

- **Increasing demand for quantitative analysis of global economic issues:**

    - e.g. Climate Policy, WTO-Doha Round, EU enlargement, Food-fuel tradeoff

- **Historically analysis was done:**

    - "in-house" in a few agencies: USDA, FAO, World Bank, etc., and

    - at a few university research centers

Limitations of Previous Projects

- **Agency-based global economics projects:**
  - **Methodology often poorly documented; rarely peer reviewed**
  - **Data base treated as strategic asset and not shared with others**
  - **Projects rarely survive change of administration: unfavorable findings result in termination**

- **University-based global economics projects:**
  - **Limited contact with policy makers (FAPRI is a notable exception)**
  - **Limited financial support**
  - **Little incentive to invest in a large data base, focus on "toy" models**
  - **When do invest, keep model and data until rents are fully extracted**

GTAP

- **Combines the advantages of both approaches.**
- **Publicly funded project:**
  - **based in academia (Purdue University, Center for Global Trade Analysis),**
  - **supports a global economic data base and model which are:**
    - **fully documented;**
    - **publicly available;**
    - **easy to use with regular courses; and**
    - **accessible to non-modelers.**

Key Resources: Data Base

- **Philosophy:**
  - Comparative advantage: Find the best person in the world to do the job and sell them on it!
  - Documentation, public availability and regular updates (v. 7 currently in prerelease review)
- **GTAP establishes standards, and brings it altogether into ONE analytical data base:**
  - Global coverage: 111 regions (vs. 13 in version 1)
  - Sectoral detail: 57 sectors (vs. 37 in version 1)
  - Bilateral tariffs and trade data/shipping margins
  - Greenhouse Gas Emissions: CO_2 and non-CO_2 (EPA)
  - Global land use: EPA funded project

Key Resources: The Consortium

- **Core support from 24 institutions:**
  - International: WBank, ADB, IDB, OECD, UNECA, UNCTAD, WTO, IFPRI, FAO, EU, IFPRI
  - National: Australia, Japan, Germany, Holland, Denmark, United States (USDA, EPA, US-ITC)
  - Private & non-profit: Nathan Assoc, MIT global chg
- **Agencies represented on the advisory board**
- **Core funding and advice on future direction**
- **Keeps project policy-focused**

Key Resources: Network

- **GTAP Web Site http://www.gtap.agecon.purdue.edu/**
  - **Web is key to communication and dissemination of information**
  - **>6500 people from >100 countries – contributing data, altering the model, writing papers, attending conferences**
  - **>thousands of GTAP based applications**
- **Annual Conferences: Washington (2004), Germany (2005), UN-Ethiopia (2006), Purdue (2007), Helsinki (2008), UN-Chile (2009), UN-Thailand (2010)**

Distribution of Network Members

Region	Total Members	Network Percentage	Per Capita (millions)
Africa	710	10.89%	0.9
Asia	2155	33.06%	0.6
Europe	1613	24.75%	2.7
North America	1383	21.22%	2.8
Oceania	270	4.14%	8.7
South America	383	5.88%	1.1

Key Resources: Models

- **Core model:** Hertel (ed.), 1997, Cambridge Univ. Press:
    - Relatively standard, multi-region GE model
    - Perfect competition/constant returns to scale: clearly a simplification
    - International trade: tracks bilateral trade as well as transport margins
    - Fully documented, easy to use and easy to modify
- **Special purpose extensions include (and many more):**
    - Energy, emissions and climate change mitigation
    - Global land use impacts of trade/environmental policies
    - Technology spillovers
    - Imperfect competition
    - International migration
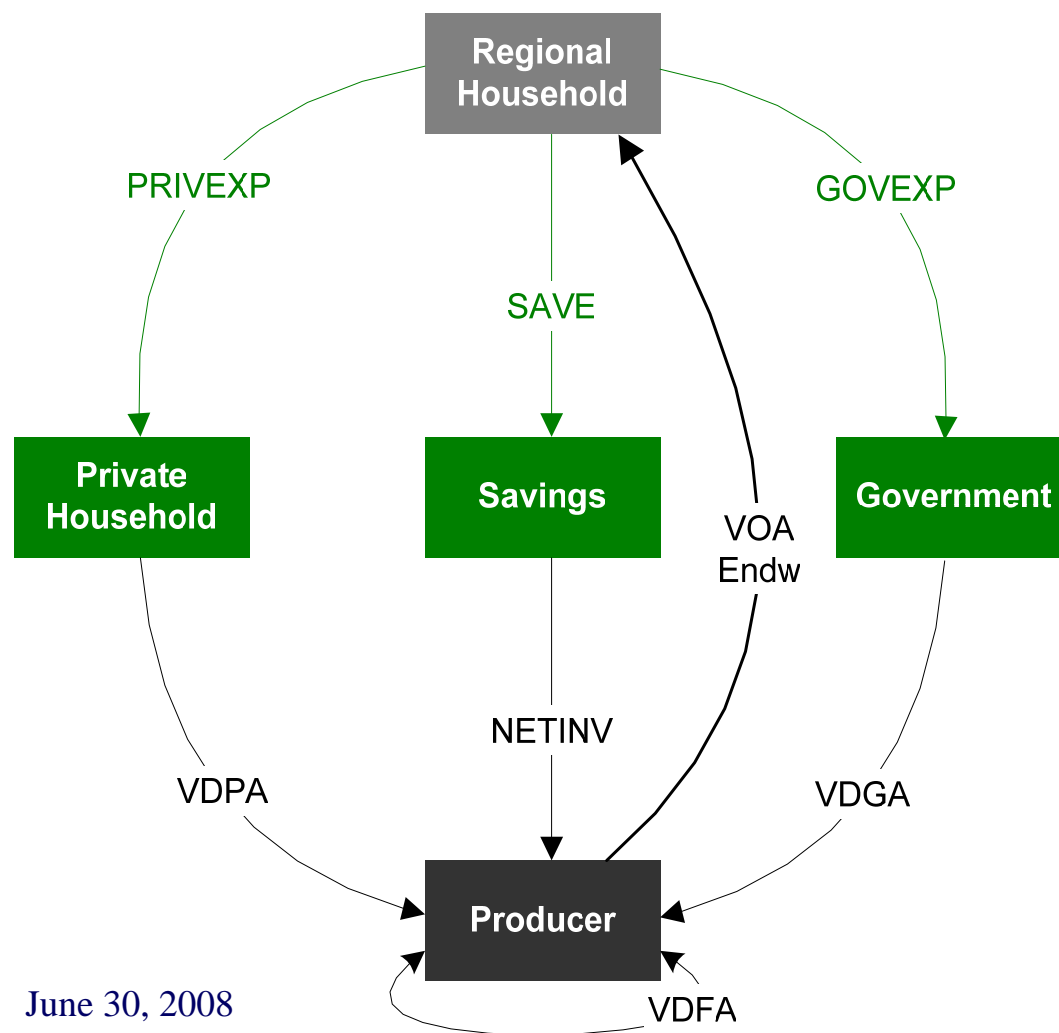   - Recursive dynamics and international capital mobility

Regional Household and Components of Final Demand
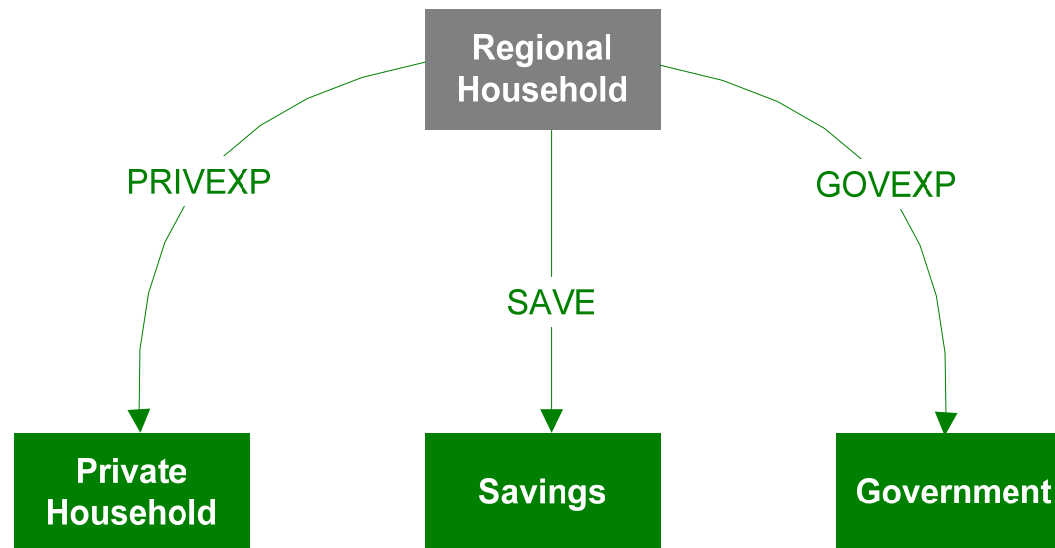
Regional household receives all income generated and spends that income according to a Cobb-Douglas utility function

One Region Closed Economy Firms
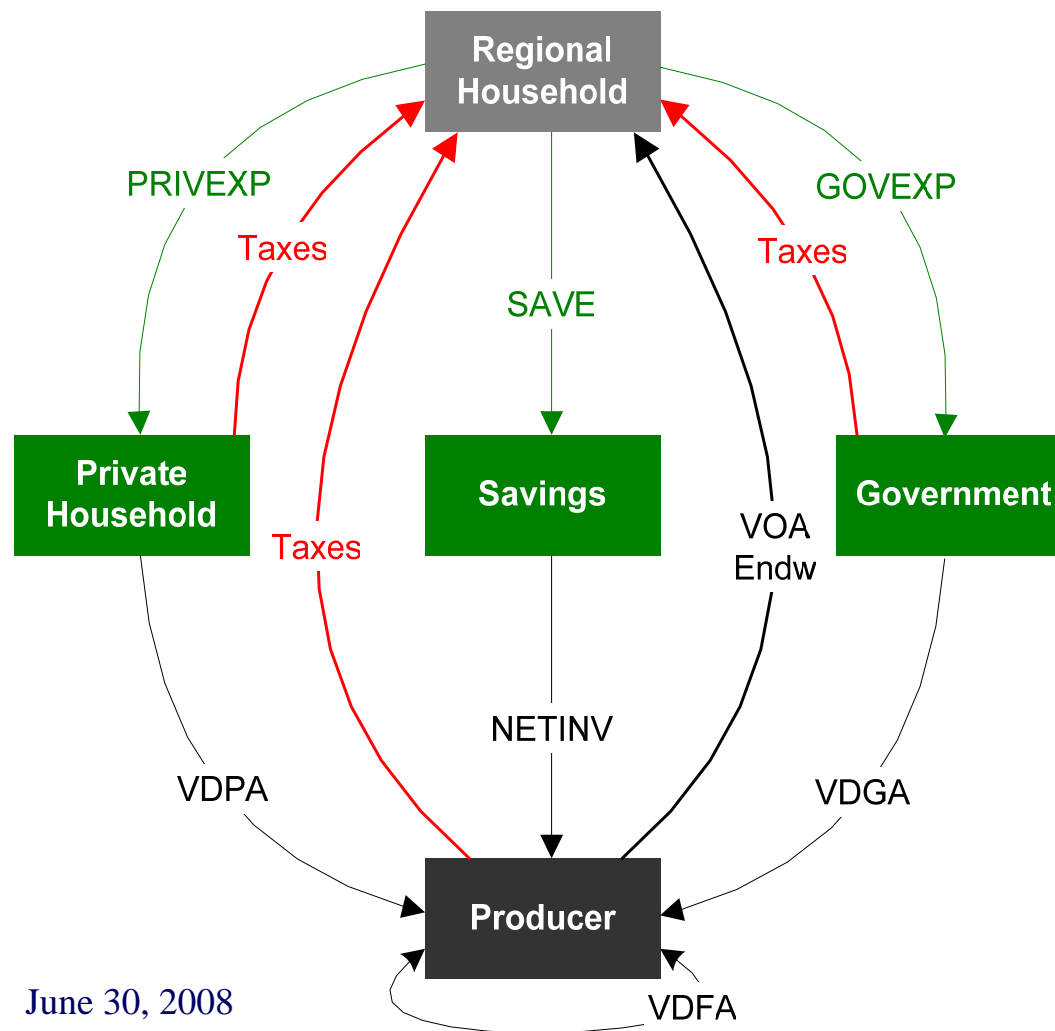

Firms sell to int & final demand

Zero profits

Constant returns to scale

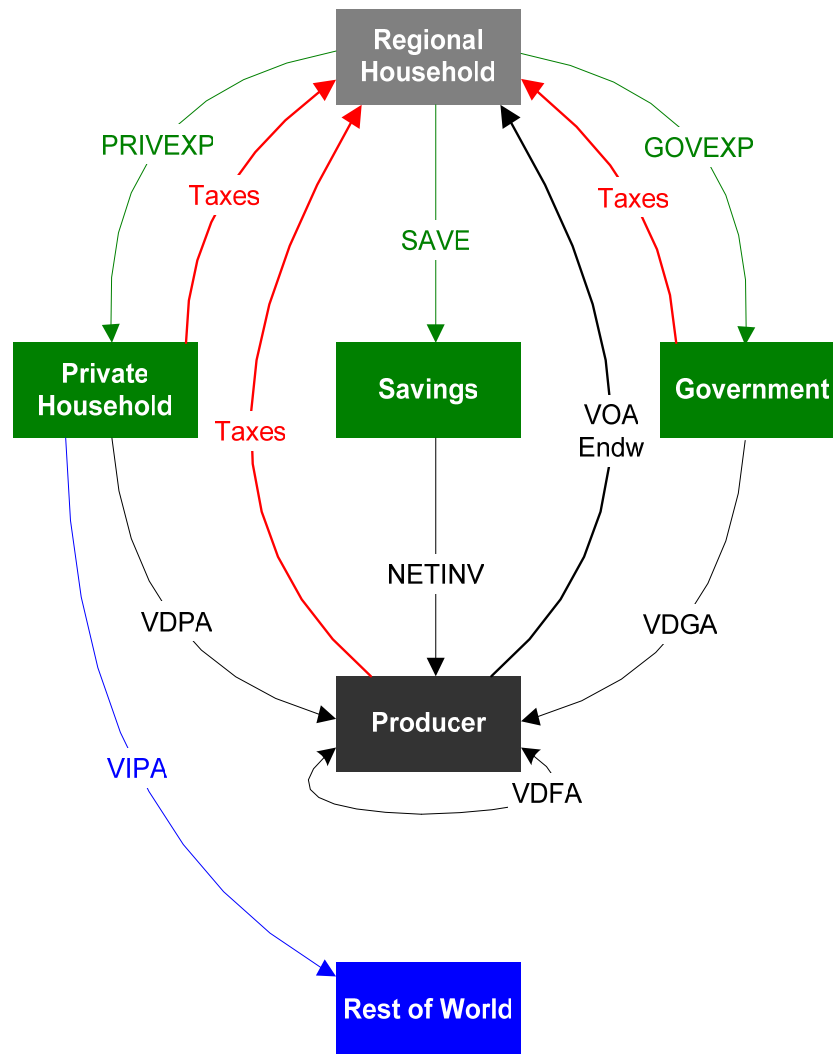Investment is savings driven

One Region Closed Economy Taxes (and subsidies)

All taxes accrue to household
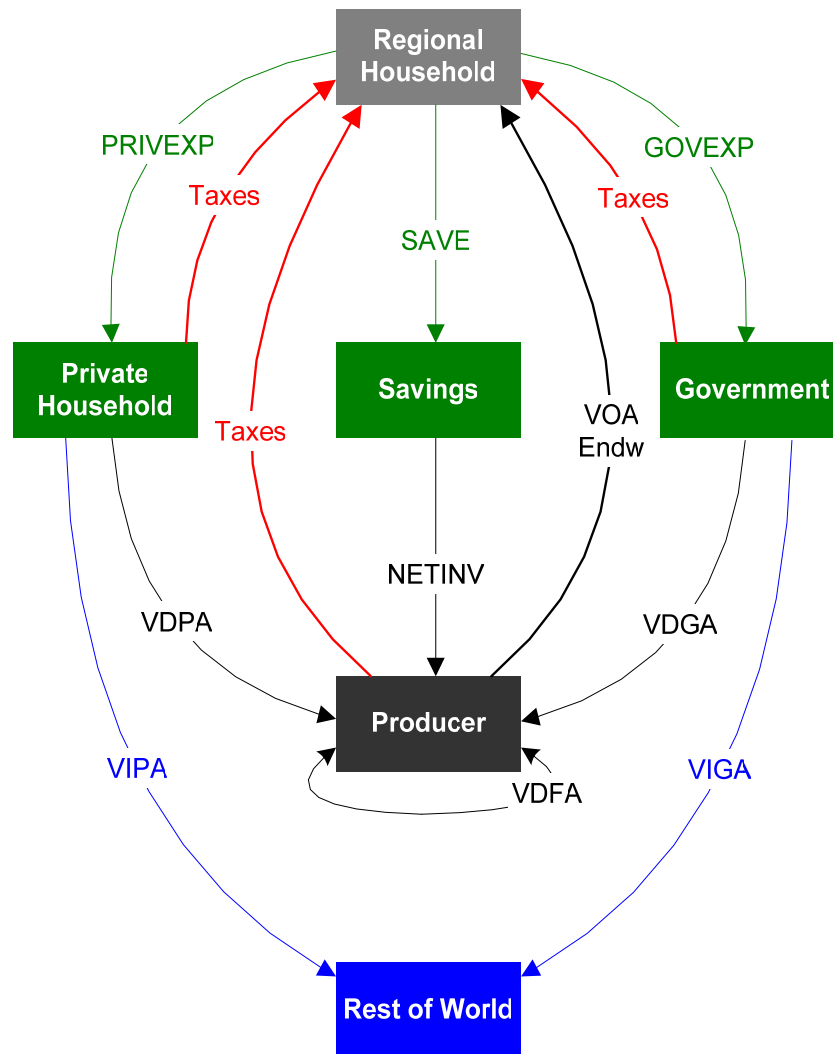
Income = VOA + taxes - subsidies

Adding trade: purchase imported goods from RoW (in fact, each region has same structure)

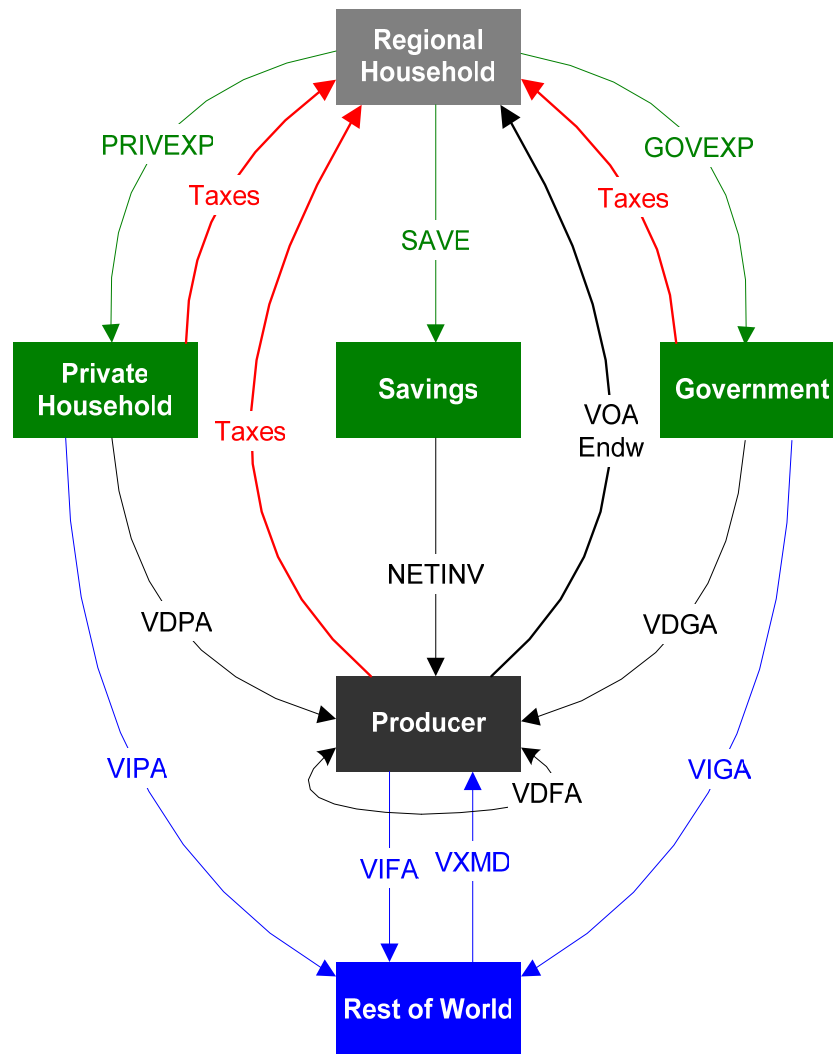Value of expenditure on imports by private household at agent prices.

Armington assumption

Adding trade: consumers purchase imported goods

Value of expenditure on imports by private households and government at agent prices.
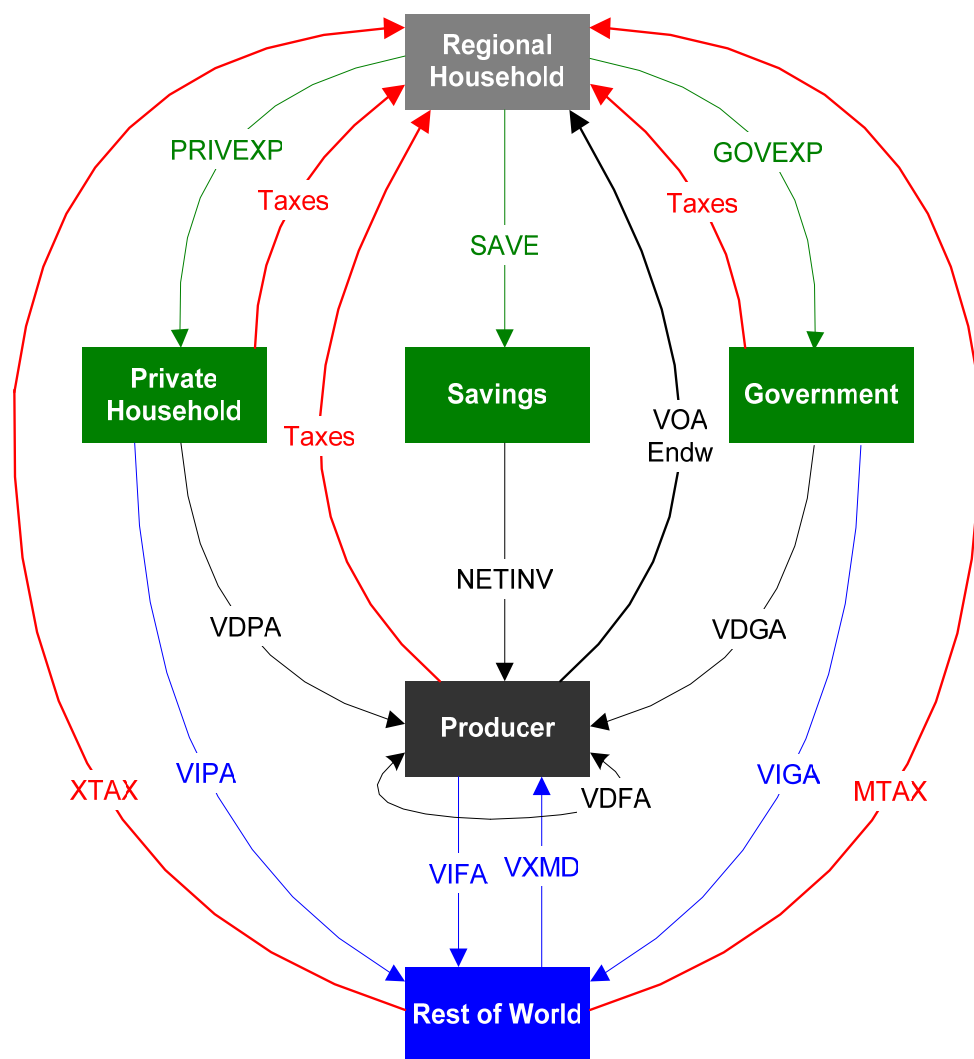
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Firms purchase imported goods and sell their products overseas

Value of imports by firms at agent prices.

Value of exports at exporter's prices.

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Imports and exports are taxed

Value of export taxes

Value of import tariffs

Strengths and Limitations

- **Strengths:**
  - Widespread use facilitates replication by others: this is NOT a black box
  - Widely used for 'regulatory' analysis of trade policy issues in the US and overseas. This is the workhorse for analysis of bilateral and multilateral trade agreements. Other models built upon GTAP data base are used for policy advice in the climate area in US (MIT-EPPA), Australia (ABARE), Netherlands (LEITAP) etc.
  - CGE framework ensures complete accounting of impacts on other sectors
  - Data base is peer-reviewed and continually improved

- **Limitations:**
  - Large models involve many parameters and are difficult to validate
  - All GTAP applications are not equal. Given the ease of access, GTAP applications vary widely in quality. In fact there are hundreds of different GTAP-based models. Only quality control is through peer-review.

Model Validation and Robustness

- **Published papers seeking to validate GTAP have focused on replicating trade patterns (Gehlhar; Liu et al.) and agricultural price volatility (Valenzuela et al.)**

    – Model does reasonably well at predicting changes in trade shares, less well at predicting growth in trade volume over time – particularly in response to trade agreements (Kehoe)

    – Model over-predicts wheat price volatility in net importing regions, under-predicts volatility in exporting regions (Valenzuela et al)

- **For any given application, there are generally a few key parameters driving the results; use Syst Sens Analysis**

    – For land use/biofuels work, trade elasticities, yield response and acreage response are key

    – Take parameter distributions from the literature and sample from these distributions; solving the model many times. Then construct *confidence intervals* for key results